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# AXL F AI4 I 1H

**Axioline F analog input module, 4 current inputs, integrated sensor supply**

Data sheet  
8658\_en\_02

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## 1 Description

The module is designed for use within an Axioline F station. It is used to acquire analog current signals.

### Features

- 4 analog differential input channels for connecting current signals
- Connection of sensors in 2, 3, and 4-wire technology
- Current ranges: 0 mA ... 20 mA, 4 mA ... 20 mA,  $\pm 20$  mA
- Simultaneous scanning of all channels by means of simultaneous sampling
- High crosstalk attenuation between the channels, thanks to separate signal paths
- Particularly robust against electromagnetic interference
- Device type label stored
- Diagnostic and status indicators



This data sheet is only valid in association with the UM EN AXL F SYS INST user manual.



Make sure you always use the latest documentation. It can be downloaded from the product at [phoenixcontact.net/products](http://phoenixcontact.net/products).

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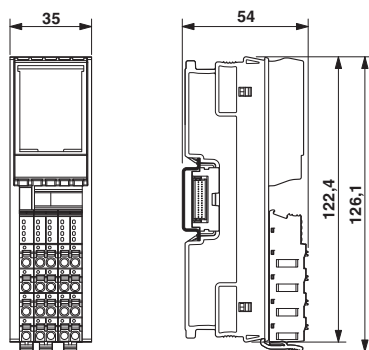
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### 3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Axioline F analog input module, 4 inputs: 0 - 20 mA, 4 - 20 mA, ±20 mA, 2, 3, and 4-conductor connection technology, integrated sensor supply (including bus base module and connectors)	AXL F AI4 I 1H	2688491	1
Accessories	Type	Order No.	Pcs. / Pkt.
Axioline F bus base module for housing type H (Replacement item)	AXL F BS H	2700992	5
Axioline shield connection set (contains 2 busbar holders and 2 SK 5 shield connection clamps)	AXL SHIELD SET	2700518	1
Zack marker strip for Axioline F (device labeling), in 2 x 20.3 mm pitch, unprinted, 25-section, for individual labeling with B-STIFT 0.8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZB 20,3 AXL UNPRINTED	0829579	25
Zack marker strip, flat, in 10 mm pitch, unprinted, 10-section, for individual labeling with M-PEN 0,8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZBF 10/5,8 AXL UNPRINTED	0829580	50
Insert label, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK X, THERMOMARK S1.1, Mounting type: snapped into marker carrier, Lettering field: 35 x 28 mm (Marking)	EMT (35X28)R	0801602	1
Documentation	Type	Order No.	Pcs. / Pkt.
User manual, English, Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers, and error messages	UM EN AXL F SYS DIAG	-	-

### 4 Technical data

#### Dimensions (nominal sizes in mm)



Width	35 mm
Height	126.1 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7.5 DIN rail is used (according to EN 60715).

#### General data

Color	traffic grey A RAL 7042
Weight	145 g (with connectors and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C

General data	
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1
Mounting position	Any (no temperature derating)

Connection data	
Designation	Axioline F connector
Connection method	Push-in technology
Conductor cross section solid / stranded	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> / 0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface Axioline F local bus	
Connection method	Bus base module
Transmission speed	100 MBit/s

Communications power	
Communications power $U_{BUS}$	5 V DC (via bus base module)
Current consumption from $U_{BUS}$	typ. 120 mA, max. 150 mA

I/O supply	
Supply of analog modules $U_A$	24 V DC (I/O supply and sensor supply)
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from $U_A$	typ. 38 mA ( $I_{IS} = 0$ mA) max. 45 mA ( $I_{IS} = 0$ mA) typ. 118 mA ( $I_{IS} = 4 \times 20$ mA (nominal load)) max. 125 mA ( $I_{IS} = 4 \times 20$ mA (nominal load)) typ. 238 mA ( $I_{IS} = 4 \times 50$ mA (full load)) max. 245 mA ( $I_{IS} = 4 \times 50$ mA (full load))
Surge protection	Electronic (35 V, 0.5 s)
Protection against polarity reversal	Polarity protection diode
Transient protection	Suppressor diode

Total power consumption of the module	
Power consumption	typ. 1.5 W (at $U_{BUS}$ and $U_A$ ), max. 1.83 W (at $U_{BUS}$ and $U_A$ )

Analog inputs	
Number of inputs	max. 4 (differential inputs, current)
Connection method	Push-in technology
Connection method	2, 3, 4-wire (shielded)
Current input signal	0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA
Resolution A/D	16 bit
A/D conversion time	31.25 $\mu$ s
Limit frequency (3 dB)	30 Hz, 12 kHz
Measured value representation	16 bits (15 bits + sign bit)
Data formats	IB IL, S7-compatible
Process data update	160 $\mu$ s
Input filter	30 Hz, 12 kHz and mean-value generation (can be parameterized)
Precision	0.1 % (of measuring range final value for active mean-value generation and 30 Hz filter)

### Analog inputs

Transient protection of inputs	Suppressor diode
Input resistance current input	104 Ω (typical)
Open circuit response	Going to 0 mA; open-circuit detection from 4 mA ... 20 mA
Overload protection	No; ±5.2 V DC, maximum, I <sub>max</sub> = 50 mA

### Configuration and parameter data in a PROFIBUS system

Required parameter data	7 Byte
Need for configuration data	6 Byte

### Electrical isolation/isolation of the voltage areas

Test section	Test voltage
5 V communications power (logic), 24 V supply (I/O)	500 V AC, 50 Hz, 1 min
5 V supply (logic)/analog inputs	500 V AC, 50 Hz, 1 min
5 V supply (logic)/functional earth ground	500 V AC, 50 Hz, 1 min
24 V supply (I/O)/analog inputs	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min
Analog inputs/functional earth ground	500 V AC, 50 Hz, 1 min

### Mechanical tests

Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock according to EN 60068-2-27/IEC 60068-2-27	10g

### Conformance with EMC Directive 2004/108/EC

#### Noise immunity test in accordance with EN 61000-6-2

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B; 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A; Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion B, 2 kV
Transient surge voltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B; supply lines DC: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical); ±1 kV to shielded I/O cables
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A; Test voltage 10 V

#### Noise emission test according to EN 61000-6-3

Radio interference properties EN 55022	Class B
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### Approvals

For the latest approvals, please visit [phoenixcontact.net/products](http://phoenixcontact.net/products).

## 5 Tolerance data

### The following applies for tolerance values:

The data is valid for nominal operation ( $U_A = 24\text{ V}$  in the default configuration (unless documented otherwise).

Default configuration: Filter with 30 Hz, 16-sample mean-value, IB IL format.

160  $\mu\text{s}$  update time (12 kHz filter, without mean-value generation)

Tolerances at $T_A = 25^\circ\text{C}$				
Measuring range	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 100\ \mu\text{A}$	$\pm 160\ \mu\text{A}$	$\pm 0.5\%$	$\pm 0.8\%$

160  $\mu\text{s}$  update time, default (30 Hz filter, 16-sample average value)

Tolerances at $T_A = 25^\circ\text{C}$				
Measuring range	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 20\ \mu\text{A}$	$\pm 60\ \mu\text{A}$	$\pm 0.10\%$	$\pm 0.30\%$

Typical data contains offset error, gain error, and linearity error in the respective default setting.

All tolerances indicated as a percentage are related to the positive measuring range final value.

Please also observe the values for temperature drift and the tolerances under influences of electromagnetic interferences.

Tolerance and temperature response at $T_A = -25^\circ\text{C}$ to $+60^\circ\text{C}$		
Measuring range	Drift	
	Typical	Maximum
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 100\ \text{ppm/K}$	$\pm 150\ \text{ppm/K}$

The drift values refer to the relevant measuring range final value.

Tolerances influenced by electromagnetic interference		
Electromagnetic fields	EN 61000-4-3/ IEC 61000-4-3	$< \pm 0.1\%$
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	$< \pm 0.1\%$
Conducted interference	EN 61000-4-6/ IEC 61000-4-6	$< \pm 0.1\%$

Additional tolerances may occur due to the influence of high-frequency electromagnetic interference caused by wireless transmission systems in the near vicinity. The values specified refer to nominal operation in the event of direct interference to components without additional shielding such as a steel cabinet, etc.

The above mentioned tolerances can be reduced by providing further shielding measures for the I/O module (e.g., use of a shielded control box/control cabinet, etc.).

## 6 Internal circuit diagram

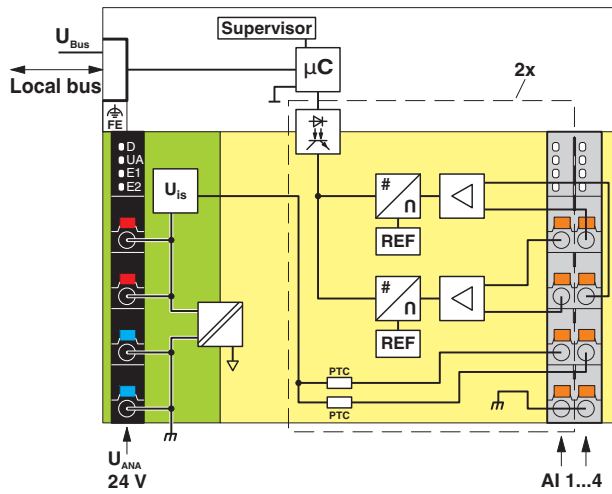


Figure 1 Internal wiring of the terminal points

Key:

Local bus

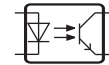
Axioline F local bus  
(hereinafter referred to as local bus)  
Hardware monitoring



Microcontroller



Optocoupler with bipolar buffer



Power supply unit with electrical isolation



Analog/digital converter



Input amplifier



Reference voltage source



Electrically isolated areas



Noiseless ground



Reference ground of analog voltage



Reference ground for communications power



Reference ground of sensor supply U<sub>IS</sub>





## 7 Terminal point assignment

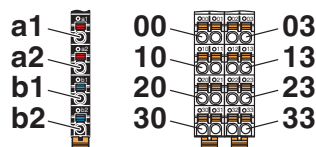


Figure 2 Terminal point assignment

Terminal point	Color	Assignment
<b>Supply voltage input</b>		
a1, a2	Red	24 V DC (U <sub>A</sub> ) Analog module supply (internally jumpered)
b1, b2	Blue	GND Reference potential of the supply voltage (internally jumpered)
<b>Analog inputs</b>		
00 ... 03	Orange	I1+ ... I4+ Positive current connection for channel 1 ... 4
10 ... 13	Orange	I1- ... I4- Negative current connection for channel 1 ... 4
20 ... 23	Orange	U <sub>IS1</sub> ... U <sub>IS4</sub> 24 V sensor supply for channel 1 ... 4
30 ... 33	Orange	GND Reference potential of sensor supply

## 8 Connection examples

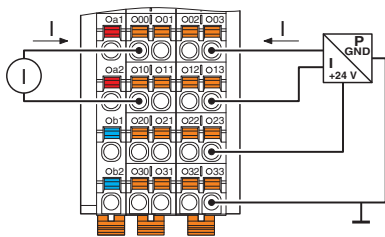


Figure 3 Connection for current measurement

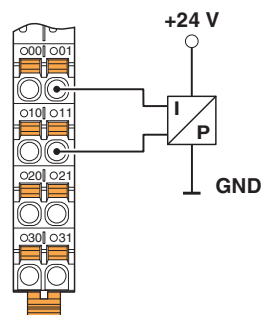


Figure 4 Passive pressure sensor at a differential current input

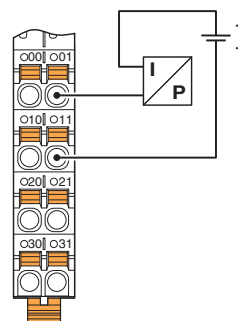


Figure 5 Differential current input with passive 2-wire transmitter (current loop)

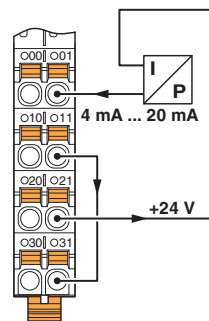


Figure 6 Differential current input with passive 2-wire transmitter (current loop)

## 9 Connection notes



**NOTE: Damage to the electronics/measuring errors**

Always connect the analog actuators using shielded twisted-pair cables.

Unshielded cables may lead to values outside the specified tolerance limits in environments subject to heavy noise.

Connect the cable shield to functional earth immediately after the cables enter the control cabinet.

If there is no closed control cabinet, connect the shield to a shield bus.

Use the AXL SHIELD SET Axiline shield connection set for an optimized connection directly in front of the module.



For further information on shielding, please refer to the UM EN AXL SYS INST user manual.

## 10 Local status and diagnostic indicators



Channel errors are errors that can be associated with a channel.  
Periphery errors are errors that affect the entire module.

Figure 7 Local status and diagnostic indicators

Designation	Color	Meaning	State	Description
D	Red/yellow/green	Diagnostics of local bus communication		
		Power down	OFF	Device in (power) reset.
		Not connected	Red flashing	Device operating, but there is no connection to previous device.
		Reset	Red ON	Application reset Device operating, but there is still a connection to the previous device, the application is reset.
		Ready	Yellow ON	Device operating, there is still a connection to the previous device, but the device has not yet detected a valid cycle after power on.
		Connected	Yellow flashing	Valid data cycles have been detected, but the device is (not) yet part of the current configuration.
		Device application not active	Green/yellow alternating	Valid data cycles are being detected. The master application set the output data to valid, however, the slave application has not set the input data to valid as yet.
		Active	Green flashing	Device operating, communications within the station is OK. The master application does not read the input data. (The connection to the controller has not yet been established, for example.)
		Run	Green ON	Valid data cycles are being detected. All data is valid
UA	Green	U <sub>Analog</sub>	ON	Supply of analog modules present
			OFF	Supply of analog modules not present
E1	Red	Supply voltage error	ON	Supply voltage is faulty.
			OFF	Supply voltage is present.
E2	Red	Error	ON	I/O or channel error has occurred.
			OFF	No error

Error code and status of the E1 and E2 LEDs

Error	E1 LED	E2 LED
No error	OFF	OFF
Underrange	OFF	ON
Overrange	OFF	ON
Open circuit	OFF	ON
Faulty supply voltage	ON	ON
Parameter table invalid	OFF	ON
Device error	OFF	ON
Flash format error	OFF	ON



The error that can actually be reported depends on the measuring range. For additional information please refer to the tables with significant measured values in various formats.

## 11 Process data

The module uses four words of IN process data. Each channel is mapped to a word.

### Input words IN1 to IN4

The measured values are transmitted to the controller board or the computer using process data input words IN1 to IN4.

The measured values are depicted in IB IL or S7-compatible format. In both cases, the measured value is displayed in 16 bit format. The data type is Integer 16 from a technical programming point of view.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value															

In the IB IL format a diagnostic code is mapped to the input data in the event of an error.

Code (hex)	Cause
8001	Measuring range exceeded (overrange)
8002	Open circuit
8004	Measured value invalid/no valid measured value available
8020	Faulty supply voltage
8040	Device faulty
8080	Below measuring range (underrange)

## 12 Significant values in various formats

### 12.1 Significant values in IB IL format

Input data		0 mA ... 20 mA	± 20 mA	4 mA ... 20 mA
hex	dec	mA	mA	mA
8001	Overrange	> +21.6747	> +21.6747	> +21.3397
7F00	32512	+21.6747	+21.6747	+21.3397
7530	30000	+20.0	+20.0	+20.0
0001	1	+0.6667 µA	+0.6667 µA	+4.0005333
0000	0	≤ 0	0	+4.0 ... +3.2
FFFF	-1		-0.6667 µA	
8AD0	-30000		-20.0	
8100	-32512		-21.6747	
8080	Underrange		< -21.6747	
8002	Open circuit			< +3.2

The maximum measured value is 7F00<sub>hex</sub>.

Depending on the measuring range, the minimum measured value is either 0000<sub>hex</sub> or 8100<sub>hex</sub>.

### 12.2 Significant values in S7-compatible format

Input data		0 mA ... 20 mA	± 20 mA	4 mA ... 20 mA
hex	dec	mA	mA	mA
7FFF	Overrange	> +23.5157	> +23.5157	> +22.8142
7EFF	32511	+23.5157	+23.5157	+22.8142
6C00	27648	+20.0	+20.0	+20.0
0001	1	+0.7234 µA	+0.7234 µA	+4.0005787
0000	0	≤ 0	0	+4.0
FFFF	-1		-0.7234 µA	+3.9994
F940	-1728		-1.25	+3.0
9400	-27648		-20.0	
8100	-32512		-23.5157	
8000	Underrange/open circuit		< -23.5157	< +1.1852

The maximum measured value is 7EFF<sub>hex</sub>.

Depending on the measuring range, the minimum measured value is either 0000<sub>hex</sub> or 8100<sub>hex</sub>.

### 12.3 Calculation of the measured value from the process data input value

The following examples explain the calculation of the measured value from the process data input value for the measuring range 4 mA to 20 mA.

PD IW = Process data input word = input data

#### IB IL format

Resolution =  $(20 \text{ mA} - 4 \text{ mA}) / 30000 = 0.0005333$

Measured value = PD-EW x 0.0005333 mA + 4 mA

#### Example 1

PD IW                      493F<sub>hex</sub> = 18751<sub>dec</sub>  
 Value x resolution      18751 x 0.000533 mA = 10 mA  
 + 4 mA                      10 mA + 4 mA = 14 mA  
 Measured value          14 mA

#### S7-compatible format

Resolution =  $(20 \text{ mA} - 4 \text{ mA}) / 27648 = 0.0005787$

Measured value = PD IW x 0.0005787 mA + 4 mA

#### Example 1

PD IW                      6C00<sub>hex</sub> = 27648<sub>dec</sub>  
 Value x resolution      27648 x 0.0005787 mA = 16 mA  
 + 4 mA                      16 mA + 4 mA = 20 mA  
 Measured value          20 mA

#### Example 2

PD IW                      F940<sub>hex</sub> -> FFFF<sub>hex</sub> - F940<sub>hex</sub> + 1  
                                  = -1728<sub>dec</sub>  
 Value x resolution      -1728 x 0.0005787 mA = -1 mA  
 + 4 mA                      -1 mA + 4 mA = 3 mA  
 Measured value          3 mA

## 13 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted via the PDI channel of the Axioline F station.

The standard and application objects stored in the module are described in the following section.

The following applies to all tables below:

Please refer to the UM EN AXL F SYS INST for an explanation of the object codes and data types.

Abbreviation	Meaning
A	Number of elements
L	Length of the elements in bytes
R	Read
W	Write



Every visible string is terminated with a zero terminator (00<sub>hex</sub>). The length of a visible string element is therefore one byte larger than the amount of user data.



For detailed information on PDI and the objects, please refer to the UM EN AXL F SYS INST user manual.

## 14 Standard objects

### 14.1 Objects for identification (device rating plate)

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning	Contents
<b>Manufacturer</b>								
0001	VendorName	Var	Visible String	1	16	R	Vendor name	Phoenix Contact
0002	VendorID	Var	Visible String	1	7	R	Vendor ID	00A045
0003	VendorText	Var	Visible String	1	49	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Var	Visible String	1	30	R	Vendor URL	http://www.phoenix-contact.com
<b>Module - general</b>								
0004	DeviceFamily	Var	Visible String	1	14	R	Device family	I/O analog IN
0006	ProductFamily	Var	Visible String	1	6	R	Product family	AXL F
000E	CommProfile	Var	Visible String	1	4	R	Communication profile	633
000F	DeviceProfile	Var	Visible String	1	5	R	Device profile	0010
0011	ProfileVersion	Record	Visible String	2	11; 20	R	Profile version	2011-12-07; Basic Profile V2.0
003A	VersionCount	Array	Unsigned 16	4	4 * 2	R	Version counter	e. g., 0007 0001 0001 0001 <sub>hex</sub>
<b>Module - special</b>								
0005	Capabilities	Array	Visible String	1	8	R	Features	Energ_0
0007	ProductName	Var	Visible String	1	15	R	Product name	AXL F AI4 I 1H
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	24	R	Product text	4 analog input channels
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2688491
000B	HardwareVersion	Record	Visible String	2	11; 3	R	Hardware version	e. g., 2010-06-21; 01
000C	FirmwareVersion	Record	Visible String	2	11; 6	R	Firmware version	e. g., 2010-06-21; V1.10
000D	PChVersion	Record	Visible String	2	11; 6	R	Parameter channel version	2010-01-08; V1.00
0037	DeviceType	Var	Octet string	1	8	R	Module identification	00 20 00 08 00 00 00 A6 <sub>hex</sub>
<b>Use of the device</b>								
0014	Location	Var	Visible String	1	59	R/W	Location	Can be filled out by the user.
0015	EquipmentIdent	Var	Visible String	1	59	R/W	Equipment identifier	Can be filled out by the user.
0016	AppIDeviceAddr	Var	Unsigned 16	1	2	R/W	Application device address	Can be filled out by the user.

## 14.2 Object for multilingual capacity

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning	Contents
0017	Language	Record	Visible String	2	6; 8	R	Language	en-us; English

## 14.3 Object descriptions

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning
0038	ObjDescrReq	Record		2	3	Read, write	Object description request
0039	ObjDescr	Record		16	See subindices	Read	Object description
003B	PDIN_Descr	Record		3	12	R	Description of the IN process data
003C	PDOOUT_Descr	Record		3	12	R	Description of the output process data



These objects are only important for tools and are therefore not described in more detail here.  
Please refer to the basic profile for comprehensive information.

## 14.4 Diagnostics objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0018	DiagState	Record		6	2; 1; 1; 2; 1; 14	R	Diagnostic state
0019	ResetDiag	Var	Unsigned 8	1	1	W	Reset diagnostics



**Diagnostics state (0018<sub>hex</sub>: DiagState)**

This object is used for a structured message of an error.

0018 <sub>hex</sub> : DiagState (Read)				
Subindex	Data type	Length in bytes	Meaning	Contents
0	Record	21	Diagnostic state	Complete diagnostics information
1	Unsigned 16	2	Error number	0 ... 65535 <sub>dez</sub>
2	Unsigned 8	1	Priority	00 <sub>hex</sub> No error
				01 <sub>hex</sub> Error
				02 <sub>hex</sub> Warning
				81 <sub>hex</sub> Error removed
				82 <sub>hex</sub> Warning eliminated
3	Unsigned 8	1	Channel/group/module	00 <sub>hex</sub> No error
				01 <sub>hex</sub> Channel 1
				: :
				04 <sub>hex</sub> Channel 4
				FF <sub>hex</sub> entire device
4	Unsigned 16	2	Error code	See table below
5	Unsigned 8	1	More follows	00 <sub>hex</sub>
6	Visible String	14	Text (14 characters)	See table below



The message with the priority 81<sub>hex</sub> or 82<sub>hex</sub> is a one-time internal message to the bus coupler that is implemented onto the error mechanisms of the higher-level system by the bus coupler.

Error and status of the local status and diagnostics indicators

Subindex	2	3	4		6	Process data	LED			
	Priority	Channel/group/module	Error code		Text		D	UA	E1	E2
Error	hex	hex	hex	dec						
No error	00	00	0000	0	Status OK	xxxx	Green ON	ON	OFF	OFF
Faulty supply voltage	01	FF	5160	20832	Supply fail	8020	Flashing green/yellow	OFF	ON	ON
Device error	01	FF	6301	25345	CS FLASH	8040	Green ON	ON	OFF	ON
Flash format error	01	FF	6302	25346	FO FLASH	8040	Green ON	ON	OFF	ON
Parameter table invalid	01	FF	6320	25376	Invalid para	8010	Green ON	ON	OFF	ON
Open circuit	01	01 ... 04	7710	30480	Open circuit	8002	Green ON	ON	OFF	ON
Overrange	02	01 ... 04	8910	35088	Overrange	8001	Green ON	ON	OFF	ON
Underrange	02	01 ... 04	8920	35104	Underrange	8080	Green ON	ON	OFF	ON

**Reset diagnostic messages (0019<sub>hex</sub>: ResetDiag)**

You can delete the diagnostics memory and acknowledge the diagnostic messages with this object.

0019 <sub>hex</sub> : ResetDiag (Write)					
Subindex	Data type	Length in bytes	Meaning	Contents	
0	Unsigned 8	1	Reset diagnostics	00 <sub>hex</sub>	All diagnostic messages approved
				02 <sub>hex</sub>	Deletes and acknowledges all pending diagnostic messages that have not been read out
				06 <sub>hex</sub>	Deletes and acknowledges all the diagnostic messages and allows no further diagnostic messages
				Other	Reserved

**14.5 Objects for process data management**

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0025	PDIN	Var	Octet string	1	8	R	Input process data
0026	PDOUT	Var	Octet string	1	8	R	OUT process data; not applicable

**IN process data (0025<sub>hex</sub>: PDIN)**

You can read the IN process data of the module with this object.

The structure corresponds to the representation in the "Process data" section.

0025 <sub>hex</sub> : PDIN (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Octet string	8	Input process data

## 14.6 Objects for device management

These objects are available as of firmware 1.10.

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning
002D	ResetParam	Simple variable	Unsigned 8	1	1	R/W	Reset parameterization
002E	Checksum	Simple variable	Unsigned 32	1	4	R	Checksum

### Reset parameterization (002D<sub>hex</sub>: ResetParam)

This object is used to reset the module to the default settings.

To reset the module value 01<sub>hex</sub> must be transferred during write access. Any other values are not permissible and will be acknowledged with an error.

Then the default settings of the channels are loaded and all the user-set parameters are reset.

### Checksum (002E<sub>hex</sub>: Checksum)

The data of the startup objects is verified with this CRC32 checksum.

Checksum for the default setting:      44 3E 71 DC<sub>hex</sub>

## 15 Application objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0080	ParaTable	Array	Unsigned 16	6	6 * 2	R/W	Parameter table
0082	Measured Value Float	Array	Octet string	4	4 * 6	R	Measured values in the extended float format
0083	PD Min	Array	Integer 16	4	4 * 2	R	Minimum process data value
0084	PD Max	Array	Integer 16	4	4 * 2	R	Maximum process data value

### 15.1 Parameter table (0080<sub>hex</sub>: ParaTable)

Parameterize the module using this object.

In the case of valid parameters, the parameterization is stored in the module permanently.

After resetting, the module works with the last permanently stored data. Upon delivery, the module works with the default data (default settings).

0080 <sub>hex</sub> : ParaTable (read, write)				
Subindex	Data type	Length in bytes	Meaning	Default value
0	Array of Unsigned 16	6 * 2	Read/write all elements	See subindices
1	Unsigned 16	2	Parameterization of channel 1	0004 <sub>hex</sub>
:	Unsigned 16	2	:	0004 <sub>hex</sub>
4	Unsigned 16	2	Parameterization of channel 4	0004 <sub>hex</sub>
5	Unsigned 16	2	Data format	0000 <sub>hex</sub>
6	Unsigned 16	2	Reserved	0000 <sub>hex</sub>

#### Parameterization channel 1 ... channel 4

##### Parameterization word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	Filter	0	0	Mean-value	0	0	0	0	Measuring range				

Filter	Code (bin)	Code (hex)
30 Hz (default)	0	0
12 kHz	1	1

Measuring range	Code (bin)	Code (hex)
0 mA ... 20 mA (default)	0100	4
±20 mA	0101	5
4 mA ... 20 mA	0110	6
Channel inactive	1111	F
Reserved	Other	

Mean-value	Code (bin)	Code (hex)
16-sample (default)	00	0
No mean-value	01	1
4-sample	10	2
32-sample	11	3

##### Data format

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	Data format	0	0	0	0	0	0	0	0	0

Data format	Code (bin)	Code (hex)
IB IL (default setting)	00	0
Reserved	01	1
S7-compatible	10	2
Reserved	11	3

**15.2 Measured value in extended float format (0082<sub>hex</sub>: Measured Value Float)**

You can read the IN process data in IB IL or S7-compatible format with the 0025<sub>hex</sub> object.

The 0082<sub>hex</sub> object is also available.

This object provides the measured value in the highest internal accuracy of the terminal in the float format.

0082 <sub>hex</sub> : Measured Value Float (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Records	4 * 6	Read all elements
1	Record	6	Measured value for channel 1
:	:	:	:
4	Record	6	Measured value channel 4

**Measured value channel 1 ... channel 4**

Element	Data type	Length in bytes	Meaning
1	Float 32	4	Measured value in float format according to IEEE 754
2	Unsigned 8	1	Status
3	Unsigned 8	1	Unit

Structure of the float format according to IEEE 754 in the bit representation:

VEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM
-----------	--------------	--------------	--------------

- V 1 sign bit, 0: positive, 1: negative
- E 8 bits exponent with offset 7F<sub>hex</sub>
- M 23 bits mantissa

Some example values for conversion from floating point to hexadecimal representation:

Floating point	Hexadecimal representation
1.0	3F 80 00 00
10.0	41 20 00 00
1.03965528	3F 85 13 6D
- 1.0	BF 80 00 00

**Extended Float Format**

Extended Float Format is a specially defined format. It consists of the measured value in float format, a status, and a unit.

Status is necessary because the float format defines no patterns providing information on the status of the numerical value.

The status corresponds to the LSB of the diagnostic code in IB IL format (e.g., overrange: status = 01, diagnostic code = 8001<sub>hex</sub>). If status = 0, the measured value is valid.

Unit	Code
Milliampere (mA)	39 (27 <sub>hex</sub> )

Status	Code
Measured value is valid	00 <sub>hex</sub>
Measured value is invalid	Other

**15.3 Minimum process data value  
(0083<sub>hex</sub>: PD Min)**

Object 0083<sub>hex</sub> can be used to read the minimum process data values.

The values are initialized after each parameterization. The highest value is assigned for the minimum process data value.

PD Min = 7FFF 7FFF 7FFF 7FFF<sub>hex</sub>

On every analog conversion, the PD Min value is compared with the current measured values and overwritten if necessary.

0083 <sub>hex</sub> : PD Min (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Integer 16	4 * 2	Read all elements
1	Integer 16	2	Minimum process data value channel 1
:	:	:	:
4	Integer 16	2	Minimum process data value channel 4

**15.4 Maximum process data value  
(0084<sub>hex</sub>: PD Max)**

Object 0084<sub>hex</sub> can be used to read the maximum process data values.

The values are initialized after each parameterization. The lowest value is assigned for the maximum process data value.

PD Max = 8000 8000 8000 8000<sub>hex</sub>

On every analog conversion, the PD Max value is compared with the current measured values and overwritten if necessary.

0084 <sub>hex</sub> : PD Max (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Integer 16	4 * 2	Read all elements
1	Integer 16	2	Maximum process data value channel 1
:	:	:	:
4	Integer 16	2	Maximum process data value channel 4

**16 Device descriptions**

The device is described in the device description files. The device descriptions for controllers from Phoenix Contact are included in PC Worx and the corresponding service packs.

The device description files for other systems are available for download at phoenixcontact.net/products in the download area of the bus coupler used.